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Beyond the Horizon: The Limitless Potential of 3D Technology in Archaeology

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Beyond the Horizon: The Limitless Potential of 3D Technology in Archaeology



Presentation by: Rebecca Bowman

Conner's Midden



In north central Halifax County, there is a section along the Roanoke River enclosed within a horseshoe bend, which is roughly made up of 1,123 acres (US Dept. of the Interior, 1990: 1). This section was dubbed "The Cove," and has a long line of owners starting in the mid-sixteenth century with Richard Randolph, who was granted the property by King George II. This property remained unoccupied until the beginning of the American Revolution (US Dept. of the Interior, 1990:1). As this land was passed on, owner to owner, its history became rich and complex. Excavation begun December 13, 1953 by the VMI Archaeological Society (Field Notes: Conner's Midden).

Goal of my Internship

Once the digging was underway, the archaeologists found a large amount of pottery, polished and flaked stone axes, hatchets, spear and arrow heads, broken animal bones, small shells, and even human remains (US Dept. of the Interior, 1990:2).

I decided to focus my internship this past summer on three vessel fragments of varying size, mended together in the 1960s using an excessive amount of Duco cement. It was my goal to physically un-mend the previous, unsatisfactory mends and re-mend them with a new, safe adhesive. Simultaneously, I wished to 3D scan the sherds and mend them virtually in attempts to research the most efficient approach for prehistoric artifact mending.



Excess Duco cement

Getting Started



Working under Katherine Ridgway, the State Conservator at the Virginia Department of Historic Resources, I was provided access to previously mended fragments from Conner's Midden in order to learn, hands on, the steps needed to undo the poor treatment of these artifacts and conserve them in a non-intrusive and timeless manner.

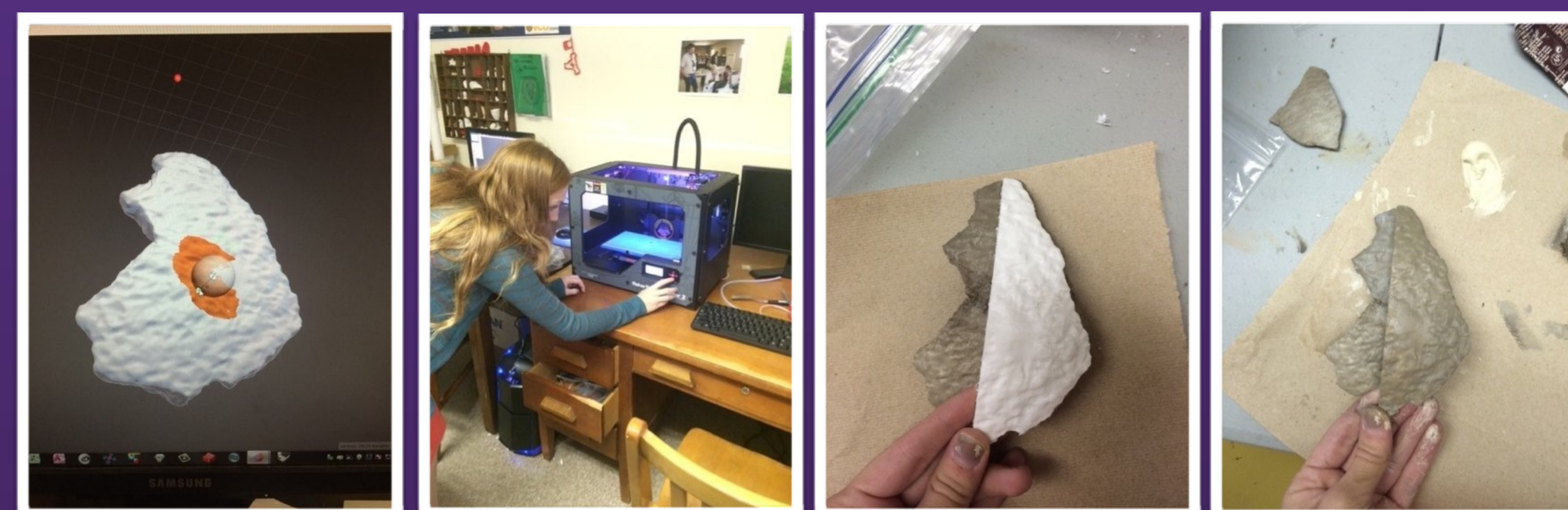
I decided to challenge myself and work on three different mended fragments, one small, one medium, and one large. Having a range of ceramic vessel fragments allowed me to further my research to include questioning whether the best conservation approach was dependent on the size of the artifact.

Physical Mending Process



The process of cleaning the artifacts demanded more time than I had originally predicted. I first postulated it would only take me a single day. This day stretched out to about a week and a half, equaling around 10-15 hours. My failed prediction of the time it would take to clean these artifacts proved as a set back to my research, pushing my schedule back further for my planned mending project. The method I used to clean the Duco cement involved a fume hood, an abundance of acetone, and hundreds of pre-rolled cotton swabs. It was necessary to conduct this work safely in a fume hood because vapors from acetone are harmful to one's liver. The acetone I used was kept in a jar that rationed the amount of liquid exposed, in order to keep evaporation at a minimum. I used so many cotton swabs because it is important to use a new swab after each use to keep the strong adhesive from being introduced into the acetone. It was also essential to roll the cotton swab back and forth, as opposed to dabbing or rubbing, to reduce the likelihood of cotton sticking to the ceramic fragments, which still proved to be a minor annoyance. The entire cleaning process, for all three of these previously mended sherds, proved to be painstakingly time consuming, a difficulty I predicted I would not encounter when virtually mending these same pieces.

Virtual Mending Process



During this month, I was also attempting to virtually mend these artifacts. After going through the process of getting permission to take the artifacts with me to VCU's Virtual Curation Lab, I was finally able to start my 3D scans using the NextEngine 3D Scanner. Under the supervision of my internship mentor, Dr. Bernard Means, I was allowed unlimited access to the Virtual Curation Lab. However, due to time constraints, I was only able to take one day to scan all three vessel fragments which occurred before I repaired the previous mending job. After scanning, I had to tediously edit all of the scans in order to fuse them together. Due to my entry-level experience at editing, this process ended up taking longer than the physical cleaning process. However, after the edits were complete, they were printed and painted in no time, topographically identical to its counterpart.

Benefits and Costs

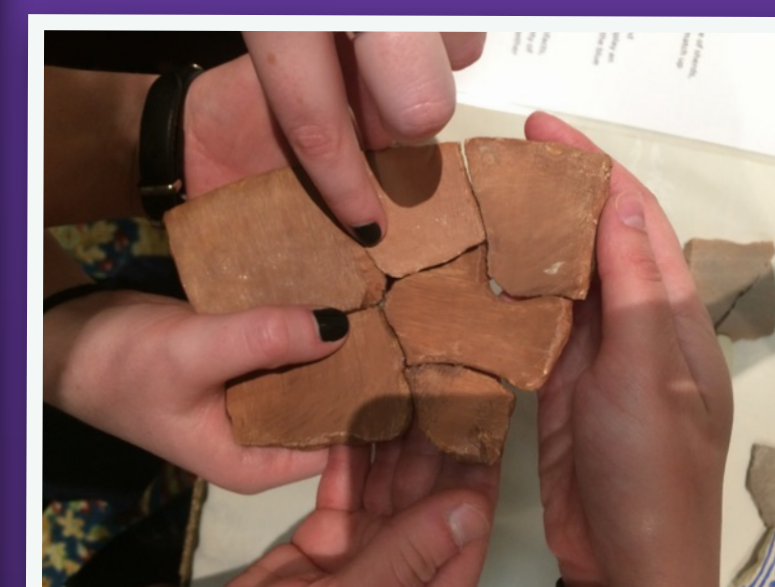


I found there are clear benefits and costs to both physical and virtual mending of artifacts. While physical mending proved satisfying, though tedious, the end product resulted in the mending of the actual artifact. However, there is always risk while handling artifacts, especially prehistoric pottery. For example, removing the Duco cement was difficult and damaging. Most of the temper and sand were surrounded in a sticky matrix. This resulted in damage during the cleaning process.

When scanning, there is no use of chemicals on the ceramic fragments, awarding scanning the least invasive method. This is important for conservation and safe object display. Virtual curation is beneficial for comparative uses as well as educational, allowing more direct public interaction with archaeology across the globe.



Research Translation



I continued to take advantage of the interactive potential of three-dimensional technology to connect the public to my findings on a kinetic level. I used 3D technology to print puzzle games of various difficulty in order to allow the public to attempt physical mending themselves and then compare their results to the virtual mends. The first workshop I conducted using the interactive potential of my research received an enormously positive response from the public, whom had previously not shown much interest in my studies. Instead of reading about research, the community was able to learn, hands-on, the same way I learned. This process granted all individuals the ability to draw the same conclusions I drew myself.

Conclusions

Overall, three-dimensional technology has offered multiple advantages over physical curation. First, it proves to be less invasive for artifacts. Second, it has the ability to replicate the same object for various interactive uses. Third, virtual curation and three-dimensional technology introduces a paradigm shift in archaeology, research presentation, and display. With 3D technology not only are more research questions available to answer, but transforming the presentation of archaeological research from primarily an academic audience to a public audience has expanded the communal comprehension of findings. This allows for better communication and interaction with those in both academic and non-academic fields and broadens the potential for future use of three-dimensional technology in archaeology.

*References available upon request